

**1986
ANNUAL
REPORT**

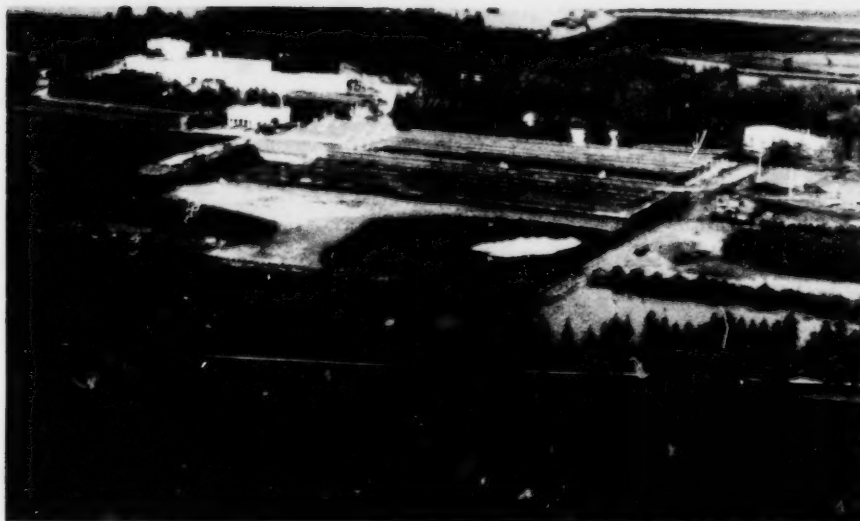
**ALBERTA
TREE NURSERY
AND
HORTICULTURE CENTRE**

Alberta
AGRICULTURE

87-04734/

1986 ANNUAL REPORT

ALBERTA TREE NURSERY & HORTICULTURE CENTRE



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EDITOR'S REPORT - A GREAT 1986!

Every facet of agricultural production in Alberta benefited from the very popular programs supplied by the Alberta Tree Nursery and Horticulture Centre in 1986.

Wind blown fields, hog and poultry barns, feed lots, cow-calf producers and farmers homes all benefited from 2.4 million shelterbelt trees provided by the Centre. Barn and house heating costs go down, soil stays in the field and rates of gain will increase with cattle when shelterbelt trees are used properly. This program is very popular for strictly economic reasons.

Along with shelterbelt trees, Alberta's urban population received 40,000 trees on Arbor Day to plant at home. This popular program is excellent in providing Alberta's young population with experience and pride in nature. Alberta's provincial parks also received trees to provide Albertans with improved relaxation time.

An industry with 94 million in sales and a net worth of 1.9 billion dollars is big business. Add the fact that it's wide open for Alberta businessmen to take advantage of and now we have interest. This is the sum total of a survey done in Alberta during 1986 which indicated each Alberta yard owner spends \$230 to maintain a \$4900 yard. Multiply it and its 94 million to maintain 1.9 billion (and then there's apartments!). The Horticulture Extension program provides province wide education to this industry, which every Albertan is part of.

The commercial greenhouse industry in Alberta boasts 56.2 hectares of greenhouse space with 1,200 full time staff. This industry greatly relies on the Commercial Greenhouse Program at the Centre. A financial growth industry with production and sales increasing each year is a good description of Alberta's greenhouse industry.

The Commercial Fresh Vegetable Program continues to make great gains in getting Alberta growers to increase acreage and try new crops. Growers are getting more and more Alberta produce on retail shelves for Alberta consumers. When this is accomplished, it's one less dollar sent out of the province.

All of the individual extension programs enjoy great response from Alberta's growers. The new administration building has added a great conference room which is used weekly by staff and grower groups for meetings and course.

It's people who make up the strength of the Centre and we are blessed with high quality professional and support staff. But we are all thankful for the farmers and growers that use the trees and horticulture expertise at the Centre in such great popularity.

PHIL DIXON
1986 Editor

INTRODUCTION

As one reads this report, the success of 1986 is evident. Mr. Dixon, as editor, has done a commendable job in putting the report together. 1986 was the year of the survey. Most of the horticulture industry, including the homeowner who uses the product, was surveyed to try to quantify the industry in terms of dollar value and labour use. Due to economic restraint, the surveys cannot be completed in 1987. The total value of the segments surveyed to date totals in excess of 4.8 billion dollars.

The 'Art' Wilson building enabled the extension staff to host a large number of educational and industry development courses which were received very well. Over 600 persons were involved in various courses initiated by staff. One of our main goals is to provide high value extension for developing horticulture crop production; large turnouts to courses indicates the need is there. Beside the courses on site, several dozen were handled in the regions. Food production courses, both on the non-commercial and the commercial level, were the most popular. On site demonstration plantings were a popular means of providing further specific information.

With increased grower confidence and knowledge, vegetable producers in northern Alberta expanded into new crops and increased the acreage of the historical crops. The future of field vegetable production is bright with crop diversification and the marketing improvements made.

The greenhouse industry had a relatively stable year with the bedding plant area increasing slightly while the cucumber area increased significantly. One to one grower contact is highly successful in providing grower information and is greatly appreciated by the grower.

Shelterbelt and woody plant extension was carried out through course work in a number of rural areas as well as participation in the World Ploughing Match at Olds. The contract growing of shelterbelt seedlings continued. Some 15 kilograms of woody plant seed was distributed to commercial nurseries for plant production.

Under restraint conditions, farm services provided excellent service to the Centre's programs as well as providing support for many other Plant Industry Division programs.

George Grainger
Director

ALBERTA TREE NURSERY AND HORTICULTURE CENTRE STAFF - 1986

George Grainger, P.Ag. Director
 Patricia Fowler Office Manager
 Michele Dannish Secretary
 Vicki Noel Courier
 Shelley Draper Receptionist

Phil Dixon P.Ag. Vegetable Specialist
 Pearl Balbar Vegetable Technician

Betty Vladicka, P.Ag. Horticulture Extension Specialist

Mirza Mohyuddin Greenhouse Specialist
 Alena Straka Tissue Culture & Greenhouse Tech.

Herman Oosterhuis, P.Ag. Shelterbelt Specialist

Brian Breneman (Shelterbelt Production) Technologist III
 Rulie Bok Gardener II
 Pat Elliott Gardener I
 Vera Fialkowski Gardener I

Thean Pheh (Grounds & Arboretum) Gardener II
 Sophie Cardinal Gardener I
 Henry Brown Gardener I

Cecilia McIsaac (Containers & Prov. Parks) Technologist III
 Joan Sumka Gardener II

Doreen Koladich (Seeds/Orchards) Gardener II
 Nancy Moroz Gardener I

Lydia Erickson (Warehouse) Ag. Officer III

Douglas Lehman (Chemicals & Seeding) Gardener II
 Kevin Thorpe Gardener I

Albert Faulkner (Farm Services) Gardener IV

Dave Wearmouth (Farm Maintenance) Gardener III
 Cyril Cooreman Gardener II
 Bruce Chedzoy Gardener I

Paul Gervais (Machine Maintenance) Mechanic
 Gerry Dames Welder
 Brian Petherbridge M.S.W. I

David S. Milne (Irrigation) M.S.W. II

STAFF CHANGES IN 1986

Only a few staff changes occurred in 1986. Rodger Baxter resigned from his Gardener II position and was replaced by Thean Pheh. The Gardener I position vacated by Thean was lost due to budget cuts. Pearl Balbar retired December 31, 1986, after 13 years at the Centre. A project position was established in 1986 to carry out the duties as receptionist. This position was filled by Shelley Draper.

Two positions were reclassified in 1986. A M.S.W. III position was reclassified to a Mechanic and a M.S.W. II position to a Welder.

SITE CHANGES AND IMPROVEMENTS

THE 'ART' WILSON BUILDING

In early 1983, a decision was made regarding the need for a new administration building due to the increase of staff and the need for more conference facilities for extension work. The new building was officially occupied in May 1986 and dedicated on August 19, 1986 to Mr. A.M. 'Art' Wilson.

Arthur Wilson was a major participant in creating programs for the benefit of the Alberta farmer and the agriculture industry.

As Director of the Plant Industry Division of Alberta Agriculture, he excelled at initiating practical delivery systems. Perhaps his most outstanding contribution was the development of municipal agriculture service boards.

The fact that Alberta today is rat-free can be attributed to the KROOA (Keep Rats Out of Alberta) program which Mr. Wilson initiated in 1952.

Farmers benefited from control and conservation programs Mr. Wilson introduced. He established disease, pest and botany laboratories to assist farmers to identify and control disease and insect pests.

He was also primarily responsible for the development of the Alberta Tree Nursery and Horticulture Centre. The nursery grows trees for farm shelterbelts, field windbreaks and roadside plantings. The trees are available to Alberta farmers free-of-charge.

Arthur Wilson was born in Galt, Ontario in 1905. He took his public and early high school in Killam, Alberta, where he was active in various farm activities and clubs. After receiving senior matriculation from Crescent Heights High School in Calgary, he attended Camrose Normal School. He taught in rural Alberta for four years before he enrolled in the faculty of agriculture at the University of Alberta. He received his B.Sc. in 1932 and an M.Sc. in agriculture in 1934.

Mr. Wilson was transferred to the Field Crops Branch of Alberta Agriculture and, in 1942, was appointed Field Crops Commissioner. In 1965, he became Director of the Plant Industry Division.

The University of Alberta awarded Mr. Wilson an Honorary Doctor of Law degree in their spring convocation in 1971.

That dedicated service to agriculture won him another honor: being admitted to the Alberta Agriculture Hall of Fame.

ALBERTA TREE NURSERY AND HORTICULTURE CENTRE ADVISORY COMMITTEE

Those present at our November 12, 1986 meeting were as follows:

Jim Howard*	George Grainger*
Mike Lastiwka	Mirza Mohyuddin*
Jim Tevelde*	Betty Vladicka*
Joe Doef*	Herman Oosterhuis*
Nigel Bowles*	Tom Krahn*
E. Purschke	Brendan Casement*
Curtis Weeks*	Ray Nyroos
Garry Johnson*	Henry Heuver
Dr. John Wiebe*	Patricia Fowler

* Members of the committee

Some notes of interest from the meeting follow:

- a. The level of extension to commercial producers of horticultural products has remained high.
- b. The greenhouse industry felt that the \$10,000 paid to Applied Bionomics for thrips research was money well spent.
- c. The first priority for the commercial fresh vegetable program is to continue work in exploring marketing opportunities.
- d. Sod farms generate 4-5 million dollars worth of business and employ approximately 120 people in Alberta. The sod growers feel that turf research has all but disappeared in Alberta and producers believe this is largely due to the lack of organized industry support. The sod growers will be supporting the Alberta Turf Research Foundation with financial support to hopefully get turf research back on track in this province.
- e. The province is lacking in urban horticulture research.

METEOROLOGICAL REPORT

TABLE I

Maximum, Minimum and Mean Temperatures at Alberta Tree Nursery
and Horticulture Centre
1986

MONTH	MAXIMUM MEAN °C	MINIMUM MEAN °C	MEAN °C	EXTREME HIGH	EXTREME LOW
January	- 1.5	-11.0	- 6.2	8.0	-21.0
February	- 7.0	-18.1	-12.6	13.5	-40.0
March	5.7	- 3.3	- 1.2	15.0	-14.0
April	9.6	- 0.9	4.4	22.5	-15.0
May	17.2	5.0	11.1	33.0	- 7.0
June	21.4	9.0	15.2	29.5	2.5
July	20.3	10.6	15.5	28.0	5.5
August	23.3	9.5	16.4	29.0	3.0
September	13.2	3.2	8.2	20.0	- 2.0
October	12.7	0.7	6.7	22.5	- 8.5
November	- 5.3	-12.6	- 9.0	11.0	-25.5
December	- 0.04	- 8.97	- 4.5	5.0	-23.0
AVERAGE	9.13	- 1.4	3.9	19.75	-12.08

TABLE II

Precipitation in 1986

MONTH	RAINFALL (MM)	SNOWFALL (CM)	TOTAL (MM)
January	tr	10.8	10.8
February	tr	4.6	4.6
March	3.8	28.1	31.9
April	12.6	11.6	24.2
May	27.3	-	27.3
June	74.0	-	74.0
July	156.2	-	156.2
August	22.9	-	22.9
September	96.0	-	96.0
October	19.6	3.0	22.6
November	6.2	12.6	18.8
December	-	3.6	3.6
TOTAL	418.6	74.3	492.9

First and last killing frost dates May 16 - September 6 (147 days).

HORTICULTURE EXTENSION PROGRAM

Increasing the public's interest in horticulture and educating them in sound management practices are the objectives of horticulture extension. This section of operations at the Alberta Tree Nursery and Horticulture Centre is responsible for the development and execution of programs on a province wide basis.

Statistics for 1986 indicate that the number of individuals requesting horticultural information is increasing and projections are that they will continue to rise. Surveys taken in the United States indicate that gardening is rapidly increasing in popularity and trends in Canada are similar.

In 1986, horticulture extension conducted a survey of private homes as part of a study to determine the economic value of horticulture in Alberta. Privately owned, single family detached houses were randomly selected in the centers of Provost, St. Paul, Lethbridge and Edmonton. The purposes of the survey were:

1. to determine the amount of money spent on an annual basis for the establishment and maintenance of plantings (interior and exterior).
2. to determine the present value of existing plantings.
3. to determine the habits and preferences of the homeowner towards horticulture.

The results indicated that the average homeowner spends over \$230 a year on plants and their maintenance. The replacement value of the existing plantings averaged over \$4900 per yard with another \$770 worth of garden structures and equipment. Applying these figures to the population data from the 1981 census, it can be estimated that Albertans in urban areas who own their own homes spend over \$94 million to maintain plantings worth over \$1.9 billion.

Horticulture extension provides information to the general public through a variety of methods and channels. In addition to the submissions to Agri-News, seventeen articles were submitted to the Edmonton Journal for their weekly gardening feature during the summer months. These newspaper submissions increased the public's awareness of our telephone information services. The number of calls received by the hort-line, a taped message changed semi-weekly, increased by 183%. Telephone inquiries handled personally by extension staff decreased by 15% because of cutbacks in the number of employees. A basic diagnostic service was also provided. Staff examined approximately 140 plant samples brought into the office.

In addition to the continued use of the department's radio program, Call of the Land, staff appeared on four phone-in talk shows for private stations in the Edmonton area and on several interviews with CBC Radio. During the summer months, horticulture extension produced a 16 minute video for the home gardener on the use of plastic mulches and tunnels to improve vegetable production.

The Alberta Tree Nursery also produced a series of slide-tape sets covering a variety of topics. These sets are available to district staff, the nursery trades and horticultural clubs. During the year, these sets were used 142 times.

Publications are another means used to disseminate information across the province. Over 68,500 copies were distributed to the nursery trades. Bulk distribution accounted for 85% of the total.

The factsheet Fairy Ring Control in Lawns was revised in 1986. Assistance was provided in the revision of the Alberta Horticultural Guide. This publication is revised every three years to update the recommendations for hardy plant material. The 'Hort Guide' is Alberta Agriculture's most popular publication. In 1986, over 43,000 copies were put into circulation.

This section also produced the newsletter, Horticulture Extension Notes (HEN), to facilitate better communication among professionals involved in horticulture extension. HEN attempts to broaden the extension skills of these individuals and keep them abreast of activities within Alberta Agriculture.

Horticulture extension staff served as technical reviewers for three chapters of the University of Alberta's home gardening correspondence course. This course has been very successful with over 3,500 copies sold in less than a year.

Displays were produced for several events throughout the year, such as: the provincial show of the Alberta Horticultural Association, field day at the Alberta Horticultural Research Center, open house at the Alberta Tree Nursery and Horticulture Centre and bench shows of several horticultural societies.

Horticulture extension staff continued to work with the district agriculturists and district home economists to provide day long courses to rural Albertans. The extension horticulturist co-ordinated the program that provided at least three horticulture courses per region. In 1986, topics offered included: landscaping the farm yard, vegetable gardening, yard maintenance, greenhouse construction and management and pest management. Courses dealing with food production have been the most popular in the last two or three years. On average, 31 people participated at each course. Feedback we received from these courses indicated that the information presented was very useful and participants wished that more courses were available.

Staff also received numerous requests for shorter presentations at rural women's conferences, and meetings of horticultural societies and other associations. In 1986, fourteen presentations were given. The extension horticulturist also gave a landscaping presentation using one of the farmyards on the tour for the agricultural service board in the County of Two Hills.

Two demonstration gardens were planted with assistance from horticulture extension. The garden in the Grasslands area demonstrated the benefits of plastic mulches and tunnels and various ways of controlling root maggots. A farm garden tour, organized in late July, visited the demonstration garden plus three other gardens in the area. The second demonstration garden was in the Smoky Lake area. This co-operative garden also demonstrated mulches, tunnels and hotcaps and some of the newer cultivars of tomatoes and cucumbers. A tour of the garden was held in late August.

Horticulture extension provided the recommendations for all the soil tests for home gardens and turfed areas that were tested by the Alberta Soils and Animal Nutrition Laboratory. In 1986, 624 reports were completed.

In addition to the extension functions, this office also serves as a liaison between the horticulture branches of Alberta Agriculture and organizations across the province. The extension horticulturist is an ex-officio member of the Trustees of the University of Alberta Devonian Botanic Garden. A major effort of the trustees has been the development of a Japanese garden. Construction of this project will start in the spring of 1987.

The extension horticulturist is also an ex-officio member of the Board of Directors of the Alberta Horticultural Association (AHA) and several of its committees including: executive, budget, judging school and handbook revisions. Assistance was provided in planning the major events of the AHA: the provincial show held in Lacombe, the annual convention held in Calgary, and the judging school held during Hort Week at Olds College. The extension horticulturist is also co-ordinator of the AHA education program. This program provides speakers to the affiliated societies for their meetings and workshops. The number of societies utilizing this program increases every year thereby increasing the number of resources available to the community.

The horticulturist is editor of the quarterly bulletin Alberta Horticulturist and their newsletter Hort Happenings. The AHA is a provincial organization with 56 affiliated societies and over 160 individual members. Horticulture extension assists these members in every possible way.

In 1986, the bedding plant industry staged a major international gathering - the annual convention and trade show of Bedding Plants Inc. This convention brought over 1,200 delegates to Edmonton and gave Alberta growers the opportunity to discuss their problems with colleagues and research scientists from around the world. The trade show exposed them to new and innovative products. The extension horticulturist was part of the local organizing committee.

The horticulturist is secretary of the Horticulture Extension and Education Advisory Committee. This committee reviews the various extension activities being carried out by all agencies throughout Alberta, examines current needs and establishes priorities to fulfill these needs. This section also participated at the meetings of other advisory committees; the Environmental Horticulture, Alberta Horticultural and Alberta Tree Nursery and Horticulture Centre.

The extension horticulturist is secretary for the Western Canadian Society for Horticulture (WCSH). The objective of this organization are to promote and foster the science of horticulture across the prairies. The Horticultural History Committee of the WCSH has been updating the historical review printed in 1956. This year, the committee on which the extension horticulturist is member, reprinted this early review and has nearly completed the update.

Alberta Agriculture provides funding to cities for urban horticultural information services through cost-sharing grants. In 1986, the cities of Lethbridge, Calgary, Edmonton, St. Albert, Airdrie and Grande Prairie participated in this program which is administered by horticulture extension. Grants were also provided to the Alberta Horticultural Association to assist in the operation of its programs, and to the Devonian Botanic Garden to assist in the maintenance of the gardens.

During 1985/86, Alberta Agriculture's district offices had over 49,000 contacts in the horticultural area. Approximately 65% of these contacts were non-farm in nature. Although the department's main thrusts are geared towards the primary producers, it cannot ignore this demand for information. Horticulture extension assists the field staff in every way possible.

Statistics For 1986

MONTH	TELEPHONE INQUIRIES	HORTLINE	SOIL REPORTS	PUBLICATIONS	PLANT SAMPLES
January	130	123	0	75	1
February	90	127	44	1,020	2
March	260	142	13	2,000	0
April	485	161	75	49,070	5
May	880	1,490	149	9,490	15
June	810	1,342	71	2,830	37
July	950	948	59	980	29
August	630	470	35	900	26
September	560	834	53	570	16
October	520	442	84	700	10
November	180	295	41	870	1
December	70	193	0	60	1
Total	5,565	6,577	624	68,565	143

Courses

Vegetable Gardening - Manning, Peace River, Debolt
 Greenhouse Grow How - Vegreville, Innisfail, Niton Junction, Westlock
 Keeping Your Yard Looking Its Best - Sherwood Park, High Prairie
 Pest Management - Coronation, Wetaskiwin

Talks

Maintenance of Interior Plants - Lethbridge Horticultural Society
 Extending the Growing Season for Vegetables - Agriculture Service
 Boards Annual Convention, Edmonton
 Greenhouse Grow How - Telfordville Further Education Council
 Landscaping the Farm Yard - Rural Women's Conference, Wetaskiwin
 Extending the Vegetable Garden - Lacombe Garden Club
 Control of Vegetable Pests - Grasslands
 Farmyard Landscaping - ASB Tour, Two Hills
 Horticultural Careers - Sacred Heart School, Edmonton
 Award Winning Annual Flowers - AHRC Field Day, Brooks
 Farmstead Beautification - Farm Women's Conference, Grande Prairie
 Vegetable Grow How - Farm Wife's Conference, Wildwood
 Backyard Pest Management - Faculty of Extension Seminar, Edmonton
 Improving Garden Soils - Faculty of Extension Seminar, Edmonton

Printed Material

Alberta Horticulturist - quarterly newsletter
 Hort Happenings - sporadically occurring newsletter
 Horticulture Extension Notes - bi-monthly newsletter

Fairy Ring Control in Lawns (Revision)

WCSH Proceedings, 1985 - Co-editor

Submitted to the Edmonton Journal:

Pesticide Safety
 Hort-Line A Hot Line for Home Gardeners
 Planting Trees and Shrubs
 Planning Your Vegetable Garden
 Plan Before You Plant
 Hardy Plants for Alberta
 Tips for a Healthy Lawn
 Select Bedding Plants With Care
 Protect Your Bedding Plants
 Annuals for Your Patio
 Facts About Fairy Ring
 Bait Them with Beer
 Useful Alternatives to Pesticides

Affiliated Organizations and Committees

Alberta Horticultural Association and its Affiliated Societies:

AHA Budget Committee
 AHA Executive Committee
 AHA Judging School Committee
 AHA Annual Convention Committee
 AHA Handbook Revisions Committee
 Trustees of the University of Alberta Devonian Botanic Garden
 Western Canadian Society for Horticulture
 Horticultural History Committee
 Canadian Society of Extension
 Canadian Society for Horticulture Science
 Alberta Institute of Agrologists
 Agrologist Institute of Canada
 B.P.I. Local Convention Committee
 Alberta Horticultural Advisory Committee
 Alberta Environmental Horticultural Advisory Committee
 Alberta Horticultural Extension and Education Committee
 Alberta Tree Nursery and Horticulture Centre Advisory Committee
 National Garden Week Committee
 University of Alberta Department of Plant Science
 University of Alberta Faculty of Extension
 Olds College
 Fairview College
 West Terra
 Northern Forest Research Centre
 Landscape Alberta Nursery Trades Association
 Alberta Greenhouse Growers Association
 Saskatchewan Horticultural Association
 Agricultural Service Boards
 Alberta Environment
 Public Works Supply and Services
 City of Edmonton - Parks Department
 City of Calgary - Parks Department

COMMERCIAL FRESH VEGETABLE PROGRAM

The commercial fresh vegetable industry in central-northern Alberta had an excellent year in 1986. Markets and prices were as good as the warm weather that produced the high quantity and quality of crops.

The commercial fresh vegetable program at the Alberta Tree Nursery and Horticulture Centre is responsible for expansion of the industry in Alberta Agriculture Regions III, IV, V and VI. The program provides leadership to growers and industry in production and marketing of Alberta fresh vegetables by an aggressive education program backed by experience and research.

Highlights of the programs 1986 achievements are:

1. Continuously involving growers and industry non-growers (wholesalers, suppliers, etc.) to create a feeling of an Alberta industry.
2. Grower involvement with 28 educational events that provided information on production and marketing.
3. Joint convention of the Alberta Fresh Vegetable Marketing Board (A.F.V.M.B.) and the Alberta Market Garden Association (A.M.G.A.).
4. Creation of "Farmers Market Awareness Week" to increase sales at markets and 250 growers in attendance at a kick-off barbecue.
5. The steady growth of Sunfresh Farms Co-op (formerly Edmonton Fresh Vegetable Growers Co-op) to become a wholesale marketing co-op for over 25 growers.
6. Research trials to keep growers informed on production developments.
7. "Alberta Produce Notes", the extension newsletter that provides monthly contact between Alberta's growers and the commercial vegetable program.

Central-northern Alberta represents a large portion of the total Alberta fresh vegetable sales of 1986 (Alberta's 1986 total is approximately 13 million in sales, representing an AFVMB record season of 6.0 million, processing of 2.25 million and market gardening of 4.75 million).

Acreage in central-northern Alberta increased in 1986 to approximately 1800 acres. Growers are increasing acreage of historical crops and are expanding into new crops. Part of this expansion is due to increased grower knowledge and part is due to increased grower confidence in the marketing system.

EXTENSION OF PRODUCTION INFORMATION

The commercial fresh vegetable program attempts to keep a pace of continuous information flow to growers. Growers involvement in the education process was excellent in 1986. Ideas are developed in the summer for courses in the winter. Summer tours in Alberta and winter tours out of province allow growers to see first hand other growers in action. The following courses, tours or meetings supplied information to growers. Each was either taught by the vegetable specialist, sponsored by the program, or the specialist presented information at a convention.

- January
 - 1) Stony Plain Growers Course I (Stony Plain)
 - 2) Stony Plain Growers Course II (Stony Plain)
 - 3) Hail & Crop Insurance Course (Edmonton)
 - 4) Red Deer Short Course (Red Deer)
 - 5) Irrigation Course (Edmonton)
 - 6) Broccoli Growing Course (Edmonton)
- February
 - 7) Research Presentation Night (Edmonton)
 - 8) Fertilizer Course (Edmonton)
 - 9) Organic Growers Course (Edmonton)
 - 10) Labor Information Day (Edmonton)
 - 11) Marketing Cole Crops (Edmonton)
 - 12) Transplant Course (Edmonton)
 - 13) Transplant Course (Fairview)
 - 14) WCSH Convention (Winnipeg)
- March
 - 15) California Tour (California)
 - 16) Insect Strategy for Cole Crops (Edmonton)
 - 17) Insect Strategy for Cole Crops (Fairview)
 - 18) Farmers Market Manager Seminars (Edmonton)
- April
 - 19) Vegetable Industry - University of Alberta Class (Edmonton)
 - 20) Pickling Cucumber Course (Edmonton)
- June
 - 21) Small Handling System Course (Edmonton)
- July
 - 22) Organic Growers Tour (Edmonton)
 - 23) Growers Barbecue (Edmonton)
- August
 - 24) Wholesalers Tour - AFVMB (Alberta)
- October
 - 25) B.P.I. (Edmonton)
- November
 - 26) Quebec Tours (Quebec)
 - 27) AFVMB and AMGA Joint Convention (Edmonton)
- December
 - 28) Lacombe Growers Tour (Edmonton)

The program's monthly newsletter, Alberta Produce Notes, is a connection between the program and the growers. The newsletter provides production and marketing information along with industry news to the Alberta fresh vegetable industry.

Growers are very involved in the program. The specialist receives approximately 130 grower phone calls per month, has approximately 30 growers visit the Centre each month while the specialist visits over 25 farms per month.

The program lent out machinery to 20 growers in 1986. This enables growers to try specialized machinery before purchasing it.

The Alberta Market Garden Development Grant provided much needed start-up funds of \$750 each to 45 growers in central-northern Alberta.

DEVELOPMENT OF MARKETS

The program is involved in creating a feeling of a true Alberta vegetable industry among growers, wholesalers and suppliers. This is accomplished by working with all of these groups on courses, tours and newsletters.

Vegetables are sold by Alberta growers via the wholesale market place, the farmers market and at the farm gate. There are gains to be made in every one of these markets.

- a. Wholesale Market: the specialist attends AFVMB meetings to lend advice on how they can best help their growers. The program helped organize the central Alberta portion of the AFVMB wholesale tour of growers operations in August and a Peace River tour in September.

Continuous work and advice on the operations of a local growers co-op has paid off in increased acreage and the movement to new crops. "Sunfresh Farms Co-op" (formerly Edmonton Fresh Vegetable Growers Co-op) now has over 25 members and marketed approximately \$250,000 worth of produce in its 1986 fiscal season. The Co-op has a general manager and now ships out of Edmonton Potato Growers warehouse. The Co-op bulk buys goods for growers and markets their produce to wholesalers. The specialist advises on day to day operations and attends their monthly Board of Directors meetings.

The Co-op promotes with in-store promotions that push the fresh quality of Alberta produce and the Better Buy Alberta aspect.

- b. Farmers Markets: the program "monitors" Mill Woods Farmers Market in Edmonton in order to teach growers and managers the details of marketing and running a farmers market. The creation of "Farmers Market Awareness Week" brought all the farmers markets in Alberta together for a successful province wide promotion in 1986. At Mill Woods, the large celebration and advertising of "Farmers Market Awareness Week" brought out 3,000 consumers (triple the normal) to the market and doubled growers incomes. This information is then provided to other market managers. The Centre hosted a kick-off barbecue for "Farmers

Market Awareness Week" that attracted 250 growers. The specialist attends Alberta Agriculture's Farmers Market Advisory Committee meetings.

- c. Farm Gate: although not a priority with the program, much of the advertising and selling at a farmers market also lends itself to the farm gate market.

RESEARCH AND FARM DEMONSTRATIONS

Research and farm demonstrations are both utilized in the program. Farm demonstrations are used for tours and newsletters to teach growers better production methods. Research trials are used to provide information for the specialist to teach growers. Both are vital to the program and the industry.

The following research trials were accomplished at the Centre:

- carrot fall seeding
- broccoli cultivars
- cauliflower cultivars
- pickling cucumber cultivars
- Chinese cabbage seeding date
- Chinese vegetable cultivars

Along with the research, six on-farm demonstration plots were at farm sites. Cultivar testing in co-operation with three Alberta college sites were monitored.

I would like to thank my 1986 staff of Pearl Balbar, Janet Visser and Belinda Choban for their tremendous dedication and support of the program and the commercial vegetable industry.

GREENHOUSE EXTENSION PROGRAM

COMMODITY REVIEW

1986 was a relatively stable year for the greenhouse industry. Significant expansion occurred in the greenhouse area for seedless cucumber production, especially in the Redcliff-Medicine Hat region. In addition to cucumbers, 12,000 m² is going to be devoted to tomato production for the 1987 season in the Redcliff area. The seedless cucumber prices were lower than 1985.

Greenhouse tomato prices dropped around the end of June and did not recover until late December. Most of the growers in the Welling area produced two crops in 1986.

Lettuce continued to be a very small crop. No expansion occurred during 1986. Some developmental work on growing lettuce indoors did take place in 1986.

Bedding plant production area increased slightly. Most of this expansion occurred away from the urban centers. It was a good year for poinsettias and Easter lilies. There was a strong interest in growing Alstromeria and Gerberias. More area will be devoted to these cut flowers during 1987.

The Alberta Greenhouse Grower's Association continued to grow during 1986. Their fourth annual convention in Lethbridge was very well organized and well attended. They held several workshops in different areas of the province. The Interior Landscapers group held a successful workshop in September.

Alberta Agriculture continued to provide extensive backup to greenhouse growers. There are now two greenhouse specialists providing extension services. The Alberta Agriculture's Soil and Animal Nutrition Laboratory continued to provide soil analyses on a priority basis to the growers. Alberta Agriculture Development Corporation was a source of funding for a few greenhouses in the province.

GREENHOUSE EXTENSION AND RESEARCH

1986 was a productive year for the greenhouse program at the Alberta Tree Nursery and Horticulture Centre. A good level of extension was maintained in terms of grower visits. These one to one visits were found to be highly useful. In problem situations, the response time was the same day. Contacts were maintained with growers in southern Alberta through the greenhouse specialist, Mr. Gordon Grant. He was invited to visit growers in central and northern Alberta. This mutual co-operation was very useful.

Making soil test recommendations was a major responsibility. Seedless cucumber growers took soil tests on a regular basis. Bedding plant growers generally took one soil test in the beginning of the season. Alberta Agriculture Soil and Animal Nutrition Laboratory continued to provide a very efficient analytical service to the growers.

Alberta Greenhouse Notes continued to be an important tool for disseminating information to the growers. Its circulation was more than 600 people across the continent, England and Turkey.

Two major surveys were completed. One was a survey of the greenhouse industry. A summary of the results is given below.

1. Number surveyed: 211 out of 230 on our list (92% completion rate).
Area surveyed: 4,688,974 ft² (435,605 m²).
Approximate area not surveyed: 956,066 ft² (88,818 m²).
Approximate area which could not be surveyed but we know it exists: 348,000 ft² (32,329 m²).
Approximate area which came to our attention after the survey was completed: 50,000 ft² (4,645 m²).
Approximate total greenhouse area: 6,043,040 ft² (561,398 m², 138.9 acres or 56.2 ha).
Approximate area not under production: 150,000 ft² (13,935 m²) due to bankruptcies.
2. Regions with greatest greenhouse area:

Medicine Hat - 38.03%
Edmonton - 20.70%
Red Deer - 11.87%

Total - 70.60%
3. Largest growing area: Medicine Hat/Redcliff (1,783,380 ft²).
4. Largest number of operations: Edmonton - 44.
5. Total number of institutional facilities - 32 (286,503 ft²).
6. Size of greenhouse operations:

10,000 ft² = 39.81%
10 - 10,999 ft² = 26.54%
20 - 49,000 ft² = 25.59%
50,000 ft² = 8.06%
7. Amount of people working full time in greenhouse industry: approximately 1,200.
8. Heating systems used:

Steam - 59 growers
Hot Water - 31 growers
Gas Furnace - 108 growers
9. Energy conservation: 104 operations have used some form of conservation of energy.

10. Total number of growers of crops:

Cucumbers	- 77	Tomatoes	- 53
Other Vegetables	- 9	Bedding Plants	- 140
Ornamentals		Foliage	- 59
(pots and cuts)	- 58	Other	- 47

11. Computers: Forty-one operations are using a computer system for environmental or bookkeeping purposes.

The second survey pertained to documenting atria problems. Sixty-six atria were surveyed in the Edmonton and Calgary area. Accumulation of salts and poor drainage were the two most common problems. The results of this survey were presented on September 6th to the Interior Landscape group.

Participation in the Alberta Greenhouse Grower's Association activities increased further during 1986. Attended all board meetings. Contributed towards the Association newsletter. Helped in the organization of two workshops which were held at the Alberta Tree Nursery and Horticulture Centre. One workshop was on bedding plants and the other was on poinsettias. Gave two talks at the fourth annual convention of the Association.

During 1986, recorded four radio programs for Call of the Land program.

Greenhouse information was provided to about 140 people who wanted to start a greenhouse business. Evaluated 12 proposals for the Alberta Agriculture Development Corporation. Acted as a resource person for several government agencies. Bedding plant production guide was completed. A poinsettia production booklet was revised for the Alberta Greenhouse Growers Association.

Demonstration Trials - Mirza Mohyuddin and Alena Straka

A modest greenhouse demonstration/research program was maintained for growers to visit and obtain first hand knowledge of crop management. Following is a brief summary of the different trials.

1. Comparison of seedless cucumber yields on peat bags and vermiculite bags: Seedless cucumber cultivars Salvador and Corona were seeded on April 24th and planted into commercially available peat bags on May 13th. The same two cultivars were also planted into vermiculite bags, provided by Bob Meiske of W.R. Grace. There were two plants/bag with a space utilization of 1.6 plants/m². Fertilizer was provided through an Anderson injector, based upon weekly tests.

Harvest started from vermiculite grown crops on June 13th and crop removed on August 25th. On peat bag grown crops, the harvest started on June 16th and crop removed on August 25th. Cultivar Salvador grown on vermiculite bags yielded 38.9 cucumbers/plant, with an average weight/cucumber of 574.2 grams.

However, the yield of Salvador on peat bags was 23.0 cucumbers/plant, with an average weight/cucumber of 504.0 grams. Cultivar Corona yielded 33.9 cucumbers/plant on vermiculite bags versus 31.6 on peat bags.

Nutritional results on vermiculite bags were always low. For example, on June 25th, the vermiculite bags showed an electrical conductivity of 1.0 mmhos/cm as compared to 2.8 mmhos on peat bags. This difference was due to much higher sulfate content in peat bags. This trend was maintained throughout the duration of the crop.

2. Production potential of pickling and slicing cucumbers under greenhouse conditions: This trial was conducted to determine the feasibility of growing pickling and slicing cucumbers in a greenhouse for early markets.

Three pickling cultivars, Spear It, Peppi and Pioneer, and one slicer cultivar, Sweet Slice, were seeded on April 24th in 12 cm plastic pots. They were transferred into 25 L plastic pots on May 13th. These plastic pots contained a soilless growing medium. The plants were fertilized through an Anderson injector with a complete fertilizer solution in which N:K ratio was maintained at 1:2.

The flower set was very good but due to the lack of pollinating agent, no cucumbers could be harvested. On June 15th, the pickling cucumbers were discarded and slicer cucumbers were moved outside. Thirteen plants of cultivar Sweet Slice yielded 13.26 kg of marketable fruit (32 fruits) until July 16th.

Further research is needed whereby honeybees could be used for pollination inside a greenhouse.

3. Effect of B-9 growth regulator on marketable yields of four tomato cultivars: Four tomato cultivars, Laura, Caruso, Concerto and W824, were seeded in 10 cm rockwool cubes on January 28, 1986. B-9 growth regulator at 2500 ppm was applied as a drench on March 6, 1986. The seedlings were transferred to NFT plastic grow channels on April 4, 1986. A complete nutrient formula was used in a recycling manner with N:K ratio of 1:2.5.

The ratio of number of leaves to first cluster was measured on May 5, 1986. There was no significant differences between the control and B-9 treated plants. The number of leaves before first cluster ranged between 5 and 8 in both treatments. The height was significantly less in B-9 treated plants.

B-9 treated plants showed a seven day delay in flowering when compared to control plants when the opening of first cluster was measured. However, first harvest was seven days earlier in B-9 treated cultivar Laura and three days earlier in B-9 treated cultivar Concerto. There were no differences in first harvest dates in the case of cultivar W824 and Caruso between B-9 treatment and control plants.

TABLE III

Comparison of Yields Between Cultivars and Growth Regulator

CULTIVAR	TREATMENTS	MARKETABLE YIELDS KG/PLANT	AVERAGE MARKETABLE NUMBER OF FRUITS/ PLANT	AVERAGE FRUIT WEIGHT
Laura	Control	3.19	18.0	117 g
	B-9	3.80	21.0	180 g
Caruso	Control	3.75	21.1	177 g
	B-9	4.30	21.8	197 g
Concerto	Control	2.60	18.4	141 g
	B-9	3.03	19.2	157 g
W824	Control	3.56	21.4	166 g
	B-9	3.86	20.5	188 g

It was concluded that B-9 did not have adverse effect on marketable yields of four tomato cultivars tested. In all cases, the yields actually improved.

4. Trials were set up to induce nutritional deficiencies in geraniums, poinsettias, bedding plants, cucumbers and tomatoes.
5. Tissue culture: M. Mohyuddin, K. Pruski and A. Straka - since June 1984, studies on propagation of plants by tissue culture technique have been carried out in our laboratory. At the beginning, research was concentrated on in vitro propagation of the saskatoon (Amelanchier alnifolia Nutt.). The main objective of this study was to find optimal conditions for micropropagation. Data obtained in this investigation was used in Mr. Pruski's M.Sc. thesis which was presented to the Faculty of Graduate Studies and Research at the University of Alberta. Later, micropropagation of other species such as raspberry, black cherry and strawberry, as well as some ornamentals such as chrysanthemums, were also studied.

In vitro propagation or micropropagation involves the aseptic production of several plantlets from a small piece of plant called an explant, usually in a test tube or flask and in nutrient medium. Its main advantages over other propagation means are the rapidity with which many plants can be produced and the ability to obtain virus-free plants. The in vitro propagation also offers prospects for the rapid propagation of difficult-to-root species including the saskatoon.

The heart of a micropropagation program is the rapid in vitro production of shoots from shoot tips that were previously obtained in vitro from explants. Within a month, dozens of such shoots can be obtained from a single subcultured shoot. Therefore, by repeating the process, millions of shoots can be produced in a year.

Three basic steps in in vitro propagation of plants are recognized:

1. establishing aseptic cultures
2. multiplication of shoots
3. rooting of shoots

In our study, micropropagation of four saskatoon cultivars, 'Smoky', 'Pembina', 'Thiessen' and 'Northline' were investigated. Aseptic cultures were established using shoot-tips (4-6 mm long) collected from actively growing branches in June or dormant terminal buds collected from branchlets in November. Shoot tips proved to be more practical, giving a higher number of active cultures. Cultures were well established after three weeks incubation at 24/22°C day/night temperature.

During the multiplication stage, it was possible to obtain up to ten good quality (15-25 mm long) shoots from one single shoot after the three week incubation period. Theoretically, according to the above multiplication ratio (1:10), it is possible to have one million shoots from just one shoot tip in about 18-21 weeks. All cultivars responded in a similar way.

Rooting of shoots obtained during the multiplication stage was conducted in both sterile conditions (in vitro) non-sterile conditions (in vitro). Rooting of in vitro derived shoots in non-sterile conditions was more successful and less complicated and is used now in all our experiments with saskatoons. Experiments were conducted on a bottom heated (25°C) greenhouse bench with intermittent mist. Rockwool blocks 3 X 3 X 3 cm soaked with a nutrient solution and rooting hormones were used over perlite. The percentage of rooted plants varied from 24.4 to 68.9%, depending on the cultivar. The best response was from cv. 'Smoky'. Satisfactory results were also obtained using commercial rooting powder 'Rootone F'. Most plants were rooted after four weeks. The big advantage of the in vitro rooting of the saskatoon plants is that these plants do not require acclimatization to greenhouse conditions as do plants rooted in vitro. The danger of losing plants during the acclimatization period is reduced to a minimum when plants are rooted directly in the greenhouse. Survival of such plants rooted in non-sterile conditions was often 100%.

Rockwool blocks were usable for rooting, however, problems with algae build-up occurred on the rockwool surface. Later studies showed that in vitro derived shoots could be rooted directly in containers (Hillson trays) filled with soilless mixture without using rockwool. The algae problem was minimized by using this method and the quality of rooted plants improved.

Presently, a study on improving the percentage rooting of plants is being carried out. First results obtained in December 1986 look promising. It was possible to achieve up to 76% rooting with cv. 'Northline' which in previous studies was the most difficult to root (24.4% rooting only). In addition to those described earlier, four more saskatoon cultivars, 'Honeywood', 'Moon Lake', 'Porter' and 'Pearson II', are under investigation.

1,000 saskatoon plants from tissue culture were provided to ten growers across the province. They were hardened plants, ready for over-wintering.

Limited work was carried out on chrysanthemums and geraniums for commercial growers. Chrysanthemum plants were brought in, in which flower color was different than the standard. The plants did not have vegetative buds at all. Through tissue culture, 50 plants were rooted and provided to the grower. Similarly, a geranium cultivar was rooted for a grower.

SHELTERBELT PROGRAM

In the spring of 1986, the following volumes of seedling sized plants were distributed to Alberta farmers:

Farmstead plantings	2,000,000
Field Shelterbelts	200,000
Roadside Shelterbelts	40,000
Replacement Plantings	160,000
Total	<u>2,400,000</u>

Acreage owners whose land holdings are principally used for residential purposes, are no longer eligible to receive planting stock for shelterbelt establishment. This policy change came into effect in June 1985 and is reflected in the distribution figures of planting stock.

Table IV exhibits the distribution of the 2.4 million seedling trees throughout the province. The following species of plants were propagated and distributed during the spring of 1986:

Northwest Poplar	68,500
Brooks #6 Poplar	178,000
Griffin Poplar	57,500
Plains Cottonwood Poplar	26,000
Laurel Leaf Willow	46,500
Acute Leaf Willow	105,000
Golden Willow	5,600
Peach Leaf Willow	13,325
Manitoba Maple	74,000
Green Ash	51,925
Bur Oak	12,275
White Birch	21,500
Mayday	76,000
Chokecherry	8,000
Russian Olive	23,300
Sea Buckthorn	4,675
Red Elder	16,550
Caragana	750,000
Villosa Lilac	210,000
Common Lilac	166,700
Honeysuckle	64,950
Dogwood	45,800
Hedge Rose	7,400
Altaica Rose	10,725
Silver Buffaloberry	11,500
Cherry Prinsepia	18,500
White Spruce	134,000
Colorado Spruce	135,000
Norway Spruce	13,500
Lodgepole Pine	41,500
Scots Pine	32,000
Siberian Larch	15,130
Conservation Bundle	2,000
Total	<u>2,447,355</u>

TABLE IV

DISTRIBUTION OF SHELTERBELT TREES IN 1986

DISTRICTS	# ORDERS	# PARCELS	# TREES	DATE SHIPPED
Warner	100	608	76283	April 17
Vauxhall	91	328	25977	April 21
Medicine Hat	162	674	72359	April 21
Taber	69	212	19533	April 21
Pincher Creek	111	463	63775	April 22
Cardston	156	670	66417	April 22
Vulcan	152	608	74555	April 23
Claresholm	186	977	110245	April 23
Sedgewick	165	626	47287	April 23
Lethbridge	228	1091	106526	April 24
Foremost	146	374	58824	April 24
Brooks	233	1006	64634	April 24
Rimbey	68	219	17390	April 24
Ponoka	63	255	18168	April 24
Three Hills	137	1474	96747	April 25
Strathmore	180	1020	55291	April 28
High River	146	925	56793	April 28
Oyen	80	505	103745	April 29
Hanna	63	506	55105	April 29
Drumheller	57	374	32094	April 30
Calgary	149	1243	73532	April 30
Olds	197	1264	97695	May 1
Rocky Mtn. House	98	333	17891	May 1
Stettler	88	320	27829	May 2
Coronation	110	690	43796	May 2
Wetaskiwin	136	557	27557	May 5
Camrose	145	734	37596	May 5
Lacombe	132	530	32688	May 5
Red Deer	200	1105	80658	May 6
Lloydminster	104	501	30305	May 7
Vermilion	121	630	35896	May 7
Provost	96	495	27170	May 8
Wainwright	97	507	30366	May 8
Bonnyville	87	403	23753	May 8
Vegreville	164	741	43428	May 9
Two Hills	101	399	21945	May 9
Smoky Lake	59	257	12479	May 9
Ryley	106	375	21714	May 9
St. Paul	134	525	31021	May 12
Lamont	154	647	35217	May 12
Lac La Biche	91	248	15813	May 12
Edson	53	189	14795	May 12
Evansburg	44	140	5786	May 12
Grande Prairie	284	1142	74492	May 13
Stony Plain	90	325	15314	May 13
Drayton Valley	29	121	5276	May 13
Westlock	121	415	21060	May 13
Thorhild	66	272	12576	May 13
Sangudo	142	513	34352	May 13
Eaglesham	51	113	5571	May 14
Fahler	112	462	35926	May 14
Peace River	97	361	19115	May 14
Fairview	101	511	27333	May 14
Spirit River	97	272	16886	May 14
Morinville	81	319	18782	May 15
Leduc	83	370	21810	May 15
Edmonton	20	74	3585	May 15
Athabasca	85	336	22431	May 15
Barrhead	104	329	20853	May 15
Valleyview	73	239	17394	May 20
Manning	66	181	12711	May 20
Ft. Vermilion	119	785	56601	May 20
High Prairie	66	195	12608	May 26
TOTALS	7146	33083	2465354	

Arbor Day Trees

In total, 39,645 seedlings were distributed during the 1986 spring season. The following cities and towns participated:

Tree Distribution

DESTINATION/CITY, TOWN	# PLANTS
Calgary	18,000
Edmonton	15,600
Lethbridge	100
Vicking	50
Morinville	260
Fort Saskatchewan	180
Wetaskiwin	300
Lacombe	350
Riley	50
Leduc	1,330
Westlock	150
Stony Plain	1,600
St. Albert	275
Sexsmith	100
Sherwood Park	1,300
Total	39,645

Growing Conditions at the Nursery

The snow cover on the fields disappeared by the middle of March (only 50 cm of snow was measured between November and March 15th). On March 24th, another snowfall of 12 cm kept the topsoil moist for a few more days. April started out with a week of warm weather (a temperature of 23°C was recorded on April 8th) and then winter returned with a sudden drop in temperature to -15°C on April 12th. This cold spell did a lot of damage to mature trees which were on the verge of budding out. Severe damage was done to the buds of the native birch, all types of poplars (native and hybrid clones), American elm, willows and Manitoba maples. A lot of these trees showed very poor leaf development, particularly in the middle section of the tree. Apparently, the top buds were already past vulnerable state (or perhaps the severe cold temperatures were lower at that altitude; I am just guessing here). Also, the catkins of the trees froze. All this damage became evident much later. Did you notice that the female poplars this early summer did not produce the normal fuzz? I subscribe this lack of seed to the killing effect of the cold snap in April. It took until well into June before the trees recovered and took on a more normal appearance. May was a dry month (27 mm or just over one inch of rain) and the weather stayed dry until the second half of June. In summary, the first five months of 1986 gave us around 145 mm of precipitation and that was as much rainfall as we received during the first three weeks in July. The rain kept coming until the first week of August.

The average temperature during July was slightly higher than normal. This, combined with the moisture, resulted in excellent growth, particularly of the cuttings of willows and poplars which were planted the first week of June. The growth of the mother stock of poplar and willow is exceptionally lush this year. So, of course, is the weed growth since the wet season started. Weeding of the 1-0 and the 1985 fall seeded deciduous stock was all completed by the third week of June. These areas did not cause much of a problem, however, the mid-summer seeded caragana showed a different picture. And in the cutting fields, sprayed with 2.24 kg of a.i. linuron directly after planting, it showed quite clearly that groundsel is not controlled through this herbicide.

The remainder of the month of August was very dry with only one third of the normal precipitation (23 mm versus a normal 68 mm). The dry weather lasted until the middle of September and the second half of that month was very wet (total September precipitation was 96 mm versus a normal record of 47 mm). There was a real outbreak of aphids from the middle of August to the middle of September. All the growth of plants, like *Prunus*, *Populus* and *Lonicera*, were loaded with this pest.

After the very first few rainy days in October, the weather turned sunny and warm. October was 1.5°C warmer than normal (mean temperature) and night frosts were very light and only occasional. This mild fall weather, combined with all the moisture in the ground, were ideal conditions for woody plants to harden off for the oncoming winter.

The large volume of soil moisture made digging for fall harvesting difficult. At the Alberta Tree Nursery and Horticulture Centre, two types of forest seedling harvesters are in use: the Egedal SRX-2 lifter and the Fobro standard bed lifter-shaker. The extra moisture made the soil so heavy that the Egedal only performed satisfactorily on the lighter (i.e. sandier) soils, while the Fobro lifter did a much better job but required many costly repairs. Again, the heavy clay loam soils at this nursery are fertile but not practical for tree seedling production.

The last three weeks of October gave warm and dry weather. This saved the fall work from becoming a disillusion. All daily highs were above freezing with many days in the upper teens. The frost set in on November 8th and the temperature then remained cold. The first snow came on November 18th and this snow cover kept the grounds covered. Another good snowfall during the first few days of December gave a good base of 10-15 cm of settled snow on all nursery production fields. This is desirable and should give added protection during the deep dormancy. The lowest recorded temperature so far was -25°C on November 12th.

EXTENSION ACTIVITIES

Shelterbelt extension and woody plant maintenance courses were held at Thorhild, Camrose, Boyle, Brooks, Calgary and Grande Prairie. The Nursery participated with a display at the Alberta Agriculture Pavillion of the World Ploughing Match at Olds. Six nurseries which are involved in contract growing of shelterbelt seedlings were visited.

NURSERY ACTIVITIES

Besides a permanent staff of seven people, 5,558 seasonal mandays were used from April 7th to November 21st in the shelterbelt tree production for 1986. The breakdown of seasonal mandays per activity is as shown in the table below.

TABLE V

NATURE OF WORK	MANDAYS	% OF TOTAL
Spring lifting and grading	722	13
Shipping	278	5
Planting - cuttings	141	2.5
Weeding	1,431	25.7
Grounds and arboretum	412.5	7.4
Transplanting - conifers	415	7.5
Fall lifting and grading	1,431.75	25.8
Seeding	56	1
Regional hardiness trials	221	4
Fertilizer trial	53	1
Tying whips	261	4.7
Miscellaneous	136	2.4
TOTAL	5,558.25	100

Shipping

This year, shipping lasted exactly one month, commencing on April 15th and ending on May 15th. A total volume of 2.46 million seedlings were shipped together with 40 bundles for 4-H and 101 schools received the 'Forever A Tree' package.

Propagation

1. Cuttings: Whips of willows and poplars trimmed and cut from December 2, 1985 to February 27, 1986 were planted out in the fields from May 26th to June 6th; a total of nine working days. Using three planting machines, a total of 1,230,000 cuttings were planted which gave an average of 136,666 cuttings per day. Growth was generally good. The crop was harvested and graded.

The final shippable volume is 487,000 giving a success rate of 39.59% which is about the same as last year's rate. This table indicates success rate of cuttings for 1986.

CROP	# PLANTED	# SHIPPABLE	% SUCCESS
Willow spp.	600,000	243,000	40.5
Poplar spp.	630,000	244,000	38.7
Total	1,230,000	487,000	39.59

2. Seeding: Due to the poor overwintering of the 1985 crop of Manitoba maple and green ash, both crops were reseeded in May 1986. For this year's crop, seeding was brought forward by a month, mid-June instead of mid-July. The rest of the crops were seeded as scheduled with the last species seeded on October 15th. The lilacs are scheduled for 1987 spring seeding.

CROP	LENGTH OF SEEDBED SEEDED
Tall Deciduous	2,090 meters
Small Deciduous	2,150 meters
Hedge Plants	8,250 meters*
Conservation Bundle	550 meters
Miscellaneous	35 meters
Total	13,075 meters

* Including 4,250 meters of lilac to be seeded in spring 1987.

162 kg of caragana was row seeded over 5.2 hectares. The seeding rate was about 90 seeds per meter.

Coniferous Transplants

Transplanting began on August 11th and the job was done by September 5th. A mixture of hot and sunny days and cool cloudy days fell within this period. Soil was moist and watering was done after transplanting. A total of 705,000 seedlings were transplanted, averaging roughly 35,000 trees per day. Breakdown of species transplanted is shown in this table.

SPECIES	AMOUNT
Colorado Spruce	317,000
White Spruce	256,560
Norway Spruce	24,188
Bugnet Pine	44,352
Lodgepole Pine	62,972
Total	705,072

Weeding

Unlike the two preceeding years, weeding was fairly hectic. Most transplanted fields and seedbed areas gave little problem except the newly seeded caragana field. A combination of a 24 day precipitation in July, the month of most effective weeding and priority having to be given to transplanting in August, left us with very weedy caragana and regional trial fields. Nevertheless, the weeds were finally brought under control by September. Weeds with seed heads were uprooted and hauled away to reduce seeds being scattered in the fields.

Lifting and Grading

Lifting started on September 22nd and were we ever glad when it was completed on October 28th! High precipitation and cloudy skies kept soil too wet to do a real good and efficient job. The undercutters broke down constantly and soil wasn't shaken off the root balls. Of course oversized caragana from fields 40 and 37 aggravated the problem. Excessive mayday, bur oak and caragana were left in the fields. Some acute leaf willows will be lifted in spring to reduce the overall shortage for willows. There is an excess of 47,600 graded and ungraded material consisting of 18 species. Breakdown of graded material ready for shipping is as follows:

Tall Deciduous	650,200
Small Deciduous	173,000
Hedge Plants	1,301,000
Coniferous	27,120
Total	2,151,320

There is also 2,010 bundles for the conservation bundle program and another 8,500 trees and shrubs set aside for the 'Forever A Tree' program.

66% of the graded stock is stored in the header house cooler which is kept at a constant -3 to -5°C. 31% is heeled in in field 28 and 3% is stored in Cooler 11 with temperature at 4°C.

Grounds and Arboretum

This year started off with the landscaping and sodding of the Art Wilson Building. The project was completed on schedule except for the north end where a patio was proposed. The planting of annuals was scaled down from 3,500 bedding plants to 2,500 as a result of putting more beds into perennials.

Regular maintenance jobs of fertilizing, pruning, lawn mowing and weeding were done as required. Some plants were replaced here and there, while only three plants namely Ussarian pear, amur cherry and griffin poplar were removed from the old arboretum due to diseases.

A new shelterbelt consisting of American elm was planted in field 40. 27 new varieties of different genera were added to the new arboretum. New material for the pinetum had been lined out in field 29 and new arboretum awaiting the construction of the pinetum.

Summary of Field Stock Performance - 1986

Hardwood Cuttings: On the whole, the crop grew as expected except for three species. The success rate for the three species is as follows:

Northwest Poplar - 27%
 Laurel Leaf Willow - 30%
 Griffin Poplar - 29%

Seedbeds: The overall germination and growth in the seedbeds were very good. The exceptions were sea buckthorn and cherry prinsepia, the former in spite of an impressive laboratory germination test of 85% germinated badly in the field this year while the latter, like the preceeding years, had delayed and sporadic germination. Some disappointment was experienced in field 35 where, because of its saddle like topography, the crops in the lower elevation were either drowned or stunted. Crops affected are honeysuckle, green ash, Manitoba maple, common lilac and villosa lilac.

CONTAINER PROGRAM

The Small Container Program - growing plant material in 37 cc and 160 cc containers for other programs.

The Large Container Program - growing native woody plants in 1, 2, 5 and 7 gallons and grow bags for the Provincial Parks.

SMALL CONTAINER PROGRAM

In 1986, 1,134,148 seedlings were grown over two crop periods. Outline of production breakdown is illustrated in this table.

TABLE VI

Small Container Production 1986

PROGRAM	DECIDUOUS SEEDLINGS	CONIFEROUS SEEDLINGS	% OF TOTAL PRODUCTION
Shelterbelt	39,168	784,464	73
Contract Growers	-	142,800	13
Provincial Parks	89,038	5,318	8
Arbor Day	-	58,800	5
Special Orders	14,560		1
Total	142,766	991,382	

Containers used to meet production requirements:

37 cc Ferdinand container = 85%
 160 cc Hillson container = 14%
 Others = 1%

Shipment to clients of 154,070 seedlings is outlined in the table below.

CLIENTS	DECIDUOUS SEEDLINGS	CONIFEROUS SEEDLINGS
Contract Growers		105,000
Arbor Day		39,740
Calgary Zoo	1,100	940
X-Mas Sales		1,000
Miscellaneous	55	6,235
Total	1,155	152,915

Seedlings overwintered totalled 1,291,782 during 1985-86, outlined in the table below:

TABLE VII
Summary Of Overwintered Seedlings

CLIENTS	DECIDUOUS	CONIFEROUS	TOTAL AMOUNTS
Shelterbelt	54,176	934,816	988,992
Special Orders	9,021	291,424	300,445
Miscellaneous	994	1,351	2,345
Total	64,191	1,227,591	1,291,782

A mortality of 2% or 30,533 seedlings was recorded in 1986.

Labour requirements for the Small Container Program is outlined below.

TABLE VIII
Labour Requirements for the Small Container Program

ACTIVITIES	WAGE LABOUR	
	MANDAYS USED	%
Charts, watering and fertilizing crops, inventory, and meetings	29	4
Filling, seeding and reseeding	162	24
Thinning and dudding greenhouse and lathhouse crops	250	37
Unloading and loading greenhouse crops	44	7
Maintenance greenhouses, lathhouses and working complexes	40	6
Pickups, ship and assemble trays	146	21
Trial work and miscellaneous	10	1
Total	681	100

New Developments - renovations of three greenhouses were completed in 1986, with double-wall plastic for roof and part of walls and remainder of walls completed with insulation board.

LARGE CONTAINER PROGRAM (Provincial Parks)

Shipment of 16,381 potted native trees and shrubs were distributed to the various parks as illustrated in this table.

TABLE IX

Distribution of Material Produced for Provincial Parks

	DECIDUOUS	CONIFEROUS
<u>Project Management</u>		
Long Lake	1,599	367
Floating Stone	315	100
Saskatoon Island	620	25
Lundbreck	510	50
<u>Southern Region</u>		
Chain Lakes	350	
Cypress Hills	700	500
Dinosaur	20	
Taber	500	
Tillebrook	25	
Woolford	140	
Writing-on-Stone	230	30
Wyndham	1,000	
<u>East Central Region</u>		
Vermilion	957	48
Gregoire Lake	1,200	750
Miquelon Lake	500	
Strathcona Science Park	260	90
<u>West Central Region</u>		
Rimby		385
<u>North Region</u>		
Carson Pegasus	50	100
High Prairie		80
O'Brien	560	50

Kananaskis Country

Bow Crow	2,310	425
Bow Valley	505	725
Lougheed Park	225	80

Total	12,576	3,805
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Deciduous species consists of: plains cottonwood, white birch, narrow leaf cottonwood, balsam and mixed poplar, willows, pincherry, wolf willow, dogwood, cinquefoil, prickly and wild rose, saskatoon, silver buffaloberry and gooseberry.

Coniferous species consists of: white spruce, jack pine, creeping and ground juniper.

Propagation of native species totalled 103,666 cavities.

PROPAGATION METHOD	DECIDUOUS	CONIFEROUS
Seeded in containers	72,576	
Cuttings in containers	14,400	
Cuttings in mist beds	4,350	12,340
Total	91,326	12,340

Potting and repotting of native species this year totalled 81,006 pots illustrated in the following table.

TABLE X

Potting and Repotting of Native Species

	DECIDUOUS	CONIFEROUS
<u>Potted</u>		
4" pot	624	5,318
1 gallon pot	33,123	22,096
2 gallon pot	4,822	
	<u>38,569</u>	<u>27,414</u>
<u>Repotted</u>		
1 gallon	582	5,318
2 gallon	3,907	4,645
5 gallon	149	422
	<u>4,638</u>	<u>10,385</u>
TOTAL	43,207	37,799

Labour requirement for the Large Container Program is illustrated in the following table.

TABLE XI

ACTIVITIES	NUMBER OF MANDAYS	%
Shipping and pick-ups	79	6
Seeding, cuttings, transplanting and repotting	472	38
Thinning, weeding and dudding pots, moving pots and irrigation	597	47
Maintenance	116	9
Total	1,264	100

New Developments

One lathhouse, 2,800 sq meters, was renovated from a gravel base with raised beds to an asphalt base with 60% raised beds.

An additional lathhouse, 2,800 sq meters, with asphalt base and drip tube irrigation has increased our space for growing potted plant material to 11,200 sq meters.

TABLE XII

INVENTORY OF STOCK IN LARGE CONTAINERS 1986-87
FOR THE PROVINCIAL PARKS PROGRAM

SPECIES	POTTED	MORTALITY	NEWLY	SHIPPED	POTTED	SHIPPABLE	HT.	SMALL
	PLANTS		STARTED		PLANTS			CONTAINER
	ON HAND		POTTED		ON HAND			STOCK
FALL '85	STOCK	85-86 POTS	1986	1986	FALL '86	1987	M	ON HAND
FOR 1987								
<u>Deciduous Large Trees</u>								
Plains Cottonwood	3,182	1,045	1,185	650	2,672	980	1.2	4,140
Green Ash	4,272	3,096			1,176			464
White Birch	5,941	2,483	914	39	4,287	1,120	1.6	1,260
Aspen	1,846	899	4,822	41	5,728			1,056
Aspen Grow Bags	7,400	30			7,370	900	1.0	
Cottonwood	2,474	681	1,726	50	3,469	500	2.0	1,050
Narrowleaf Cottonwood	555	213		140	202			
Balsam Poplar	5,901	1,086	841	1,310	4,346	400	1.75	3,540
Mixed Poplar	509	72	85	171	351	235	2.1	
<u>Coniferous Large Trees</u>								
White Spruce	14,516	96	7,420	2,758	19,052	3,000	1.2	3,600
Lodgepole Pine	707	320	10,108		10,495			2,091
Jack Pine	1,669	704	4,691	6	5,650	90	1.0	357
						7,225		
<u>Shrubs</u>								
Acute Leaf Willow	5,115	293			4,822			
Peach Leaf Willow	1,356	116			1,240			
Sandbar Willow	2,465	218		50	2,197	-2,250	1.4	840
Native Willow	4,166	613		250	3,303			
Mixed Willow	1,575	893		420	262			2,850
Chokecherry	1,314	1,264	5,519	28	5,541			18,890
Pincherry	3,747	1,999		358	1,390	100	1.2	4,362
Wolf Willow	2,663	446		350	1,867	600	1.2	1,120
Dogwood	26,640	5,479	11,415	5,606	26,964	8,250	1.0	
Silver Buffaloberry	2	2	3,576	67	3,509			1,394
Snowberry	164	75	1,080		1,169			
Cinquefoil	536	138	911	172	1,134			3,840
Bracted Honeysuckle			357		357			9,472
Prickly Rose	7,152	3,013		1,125	3,014	1,000	.5	4,640
Wild Rose	15,856	8,125	2,497	1,265	8,963	3,750	.5	192
			2,706		2,706			
Highbush Cranberry	299	162			137			1,752
Lowbush Cranberry								1,976
Saskatoon	1,097	852		245				5,520
Gooseberry	424	41	396	239	540			300
Hazelnut								20
Clematis								
Bearberry	1,879	1,443	218		654			
Labrador Tea	107	50	406		463			
Creeping Juniper	4,416	1,522	4,811	820	6,865	1,260	.3	
Ground Juniper	1,869	113	902	221	2,437	280	.4	
						17,490		
Totals	131,814	37,582 (29%)	66,586	16,381+ (Misc. 105)	144,332	24,715		74,726

CHEMICAL STORAGE BUILDING

The chemical warehouse continues to be progressively more functional each year. In addition to serving the original five designated areas fertilizer, chemical, vertebrate pest, general storage and soils, a 156.9 m² extension was constructed to accommodate the physical needs of joining the soils branch and the weed section of the crop protection branch.

In use to date are two large walk-in, thermostatically controlled drying rooms to facilitate the drying of grain and soil samples. A threshing machine, hammer-mill and small clipper mill are now operating in this large lab-like facility. Other uses will come forward as required in this shared accommodation.

Two offices, one of which serves the office needs for the entire building, was a most welcome addition.

Palletized storage in the fertilizer and chemical rooms has been upgraded by replacing all pallet boxes with new heavy-duty boxes designed to hold heavy-weight material. All chemicals and fertilizers have been transferred and, because of the pallet box sturdiness, has provided easier and safer stacking.

The entire yard area surrounding the chemical storage building has been paved providing access to all warehouse doors in any kind of weather, as well as to the nearby newly constructed baled peat moss storage shed.

SEED LABORATORY AND EXTRACTION PLANT

SEED LABORATORY

The collection this season consisted mainly of hedge plants and small deciduous species for the field and container programs at the Alberta Tree Nursery and Horticulture Centre. A total of 30 species were collected on site, in the city of Edmonton and vicinity.

The seed was cleaned and stored to ensure an adequate supply of high quality seed for future prairie planting. Various species this season produced heavy seed crops, they were: Mongolian cherry, sandcherry, common lilac, basswood, hedge rose and nanking cherry. The following species had a very poor seed crop: white spruce, colorado spruce, engelmann spruce, Siberian larch, green ash, Manitoba maple, pincherry, white birch, mayday, dogwood and Japanese rose.

A total of 14.7 kilograms of three seed species was distributed to commercial nurseries and individual growers for contract growing.

The 1986 annual seed collection and the fourteen year (1973-1986) summary of seed collection are found in Table XIII and Table XIV.

The seed inventory in cold storage at the end of the year was over 1,450 kilograms.

Seed Storage Annual Inventory - December 1986

1. Shelterbelt Program	988 kg
2. Provincial Parks	58 kg
3. Reclamation Branch	66 kg
4. Private Companies	324 kg
5. Miscellaneous	27 kg
Total	<u>1,463 kg</u>

TABLE XIII

1986 Annual Seed Collection

SPECIES	DATE OF HARVEST	AMOUNT OF FRUIT/CONES PICKED (KG)	YIELD OF CLEAN SEED (KG)
Tall Deciduous	14.08 - 27.10.86	182	36
Small Deciduous	21.07 - 27.10.86	709	82
Hedge Plants	21.07 - 05.11.86	2,053	107
Coniferous Trees	27.08 - 23.10.86	225	2
Total		<u>3,169</u>	<u>227</u>

TABLE XIV

Seed Collection Summary: 1973 - 1986

YEAR	AMOUNT OF COLLECTED FRUIT/CONES (KG)		YIELD OF CLEAN SEED (KG)	
	DECIDUOUS	CONIFEROUS	DECIDUOUS	CONIFEROUS
1973	474	103	54.14	1.40
1974	2,005	1,635	22.39	37.60
1975	682	1,808	55.40	49.05
1976	662	131	188.38	23.98
1977	868	98	203.92	12.78
1978	995	193	257.33	63.50
1979	718	4,091	102.66	69.51
1980	1,573	212	358.00	9.00
1981	1,594	1,835	518.64	9.80
1982	1,596	5,145	175.00	55.00
1983	4,108	1,422	519.00	18.00
1984	2,547	672	354.00	9.00
1985	2,506	2,272	490.00	42.09
1986	2,944	225	225.00	2.00

CHEMICAL SPRAYING SECTION

Our spraying season this year proved to be very successful and much work was completed to lessen the work load next spring.

The weather was very favorable enabling us to complete much of our work. Skoot was the only job that was not completed due to the fact it must be sprayed in above zero temperatures. We participated in the greenhouse spraying this year which ran relatively smooth.

Damage to stock this year was minimal and hopefully next spring no damage will be detected. Two rows of trembling aspen were damaged which proves to us how careful one must be when handling and spraying chemicals.

Kevin and Doug helped Lydia in the warehouse transferring fertilizer and chemicals into new pallets until December 3rd, then they helped out shelterbelt in the packing shed for the remainder of the winter.

CHEMICAL	PURPOSE	AMOUNT USED
Linuron	control of weeds in shelterbelts, spruce transplants and deciduous cuttings	340.3 litres
Killex (Premium 3-Way)	control of dandelions and annual weeds in grasses (lawns)	211.7 litres
Round-Up	control of mature weeds and perennial grasses, thistle	412.0 litres
Banvel	control of annual weeds in green manure crops, thistle control on fence lines and ditches	9.8 litres
Goal (Oxyfluralin)	control of annual weeds in spruce and pine transplants	56 ounces
Gramoxone	control of annual weeds on summer-fallow	12.5 litres
Casoron	control of annual and perennial weeds in shelterbelts, soil sterilant	2543 kg
Foligard	anti-desiccant sprayed on coniferous stock	120 litres
Basamid	soil fumigant for seedbeds	960 kg

CHEMICAL	PURPOSE	AMOUNT USED
Lorsban	root maggot control in vegetables	135 grams
Methoxychlor	control of white pine weevil	30 ounces
Malathion	control of biting insects	80 ounces
Diazinon	control of aphids in saskatoons	1867 ml
Cygon 4E	control of birch leaf miner	454 ml
Benlate	systemic fungicide, pine in LH2	60 ml
Manzate	fungicide, pine in LH2	50 ml
Thiodan	whitefly control in GH4 & 12	534 ml
Insecticidal Soap	thrips, aphids and whitefly control in GH4 & 12	513 ounces
Ambush	whitefly control in GH4 & 12	62 ml
Pentac	mite control in GH4 & 12	55 ml
Vendex 50W	mite control in GH4 & 12	15 ml
Pirimor 50	aphid control in GH4	24 ml
Temik 10G	whitefly and aphid control in GH4 & 12	500 ml
D.D.V.P.	smoke fumigant for insect control in greenhouses	71 cans @ 1 lb
Nicotine	smoke fumigant (insect control)	76 cans @ 1 lb

FARM SERVICES

Farm Services consist of maintenance and repairs, field irrigation, general cultivation, field preparation and equipment control.

Staff

There were two reclassifications in the shop: Paul Gervais from Maintenance Service Worker III to Automotive Mechanic I and Gerry Dames from Maintenance Service Worker II to Welder I.

There was a total of 22 wage staff hired for Farm Operations this season.

Mandays

April	62.97
May	304.9
June	339
July	238.56
August	267.72
September	265.91
October	167.3
November	85.6
December	15

Fertilizer Application

Fertilizer was applied the months of April, May, July and August.

46-0-0	3799 kg
34-0-0	300 kg
16-20-0	775 kg
11-51-0	4521 kg

Oat Seeding

Oats were seeded to fallowed fields as a green manure crop for soil improvement.

Random Oats	395 kg
Grizzley Oats	403 kg

Grass Seeding

Grass seedings was done to control weeds and to prevent soil erosion. This was done in May and July.

Crested Wheatgrass	202.5 kg
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Caragana Seeding

Caragana was seeded in field 30 during June at 90 seeds per meter. Caragana seed used was 152 kg.

Gravel

Gravel was spread on various field roads to maintain and improve field access. There was 509.52 tonnes of 3/4" crushed used.

Peat Moss

Peat moss was delivered during October and November. Due to wet and freezing weather conditions, only half of the tendered amount was delivered.

Peat Moss in Stock Pile	- 464 cu yards
Peat Moss Delivered	- 935 cu yards
Peat Moss Spread	- 704 cu yards

Field 6c applied:	104 cu yards
Field 6d applied:	96 cu yards
Field 7d applied:	136 cu yards
Field 7e applied:	128 cu yards
Field 12a applied:	256 cu yards
Field 25a applied:	<u>116 cu yards</u>

Total	704 cu yards
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Manure

Manure was spread on lifted areas for soil improvement.

Field Applied:

11b	80 cu yards
27d	48 cu yards
25a	40 cu yards
37a	32 cu yards
37b	<u>24 cu yards</u>

Total	224 cu yards
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The manure was supplied by the Public Stock Yards. Manure stock piled at present is approximately 625 tons.

Whips

Whips are cut and brought in as required for processing for spring planting. Some fields newly planted have the rows too close together making it difficult to go between when cutting takes place.

Cultivation

Zero cultivation was maintained again this season. Cultivation was carried out for seeding and planting. Cultivation was also done for weed control as needed in planted areas.

Fence Repairs

Several areas had to be repaired due to vehicles going through.

Pruning and Shelterbelt Removal

Dead materials were removed from several belts along with broken limbs from wind damage. Farm Operations crew removed the shelterbelts from 6c and 22a. Dead and dying poplar were removed from the ground area.

Equipment

Equipment was maintained very well this year with very little down time during the peak requirements. All servicing was carried out on schedule including spring and fall checks. Winter maintenance and repairs are now being carried out. Most repairs are being done on site with only major work being sent out.

Rodent Control

There was very little problem this season with rodents. Only two beavers were removed.

Irrigation

A good growing season, seedbeds and cuttings were established and growing good before the rain came. The season went well with better coverage on weekends and during the week. There was a good amount of moisture present all season.

The depth was taken from the reservoir with the boat in mid summer. The average depth was only 10 feet. The sediment coming downstream is filling our reservoir. This is causing suction problems. The pump that has no filter system is the worst.

The Bayou received works very well, it fits down the rowcrops and also goes over the irrigation lines without causing damage.

All the larger irrigation lines have been welded with good results. The next stage is to repair the 2" and 3" lines in the spring. The boat was used several times to remove weeds from the suction lines with good results.

The new back hoe was used several times when repairing underground lines (with fairly good results).

There was 37,584,110 litres of water supplied to field crops this season.